

### REMARKS

This Amendment is responsive to the Office Action dated August 13, 2009.

Claim 3 is amended, and claims 5 and 6 are canceled. No new matter is introduced. Applicants request reconsideration of the present application in view of the foregoing amendments and the following remarks. Applicants are submitting herewith a Request for Continued Examination.

#### Independent Claim 1

Independent claim 1 is rejected as being obvious over U.S. Patent No. 5,106,796, to Drozdyk et al. ("Drozdyk") in view of U.S. Patent No. 3,848,965, to Adams, Jr. et al. ("Adams") and U.S. Patent No. 4,959,330, to Donohue et al. ("Donohue"). Claim 1 is directed to a dielectric paste comprising "ethyl cellulose having an apparent weight average molecular weight of 110,000 to 190,000 as a binder and at least one kind of solvent selected from the group consisting of isobornyl acetate,  $\alpha$ -terpinyl acetate, I-dihydrocarvyl acetate, I-menthyl acetate, I-menthone, I-perillyl acetate and I-carvyl acetate."

#### Adams is silent with respect to using I-menthone in a dielectric paste

The Examiner states that Adams teaches use of I-menthone to form layers or films that exhibit desired dielectric properties. Applicants respectfully disagree. Adams relates to a liquid crystal imaging systems that employs an imaging member having a film or layer of an optically negative liquid crystalline material. Adams, column 1, lines 8-12. The object of the Adams invention is to improve optically negative liquid crystal films, which is stated to be useful in detecting structural flaws and medical applications. Adams, column 1, lines 30-67. Adams is therefore related to generating and manipulating negatives of an image using a film or layer of an optically negative liquid crystalline material.

To achieve its objects, Adams proposes combining a suitable optically active, non-mesomorphic material with cholesteric liquid crystalline materials or optically negative compositions including such materials. Adams, column 9, lines 22-27. As suitable optically active, non-mesomorphic material, Adams cites to derivatives of alcohols, derivatives of carboxylic acids, and derivatives of amines. Adams, column 9, lines 44-52. For each of these

derivatives, Adams cites to numerous example compounds, one of which under the alcohol derivatives is *l*-menthone. Adams, column 9, line 47. Even after providing a long list of the foregoing derivatives, Adams states that this list of materials is not exhaustive for options for an optically active, non-mesomorphic material. Adams, column 9, lines 58-61.

Accordingly, in contrast to the Examiner's assertion, Adams is completely silent as to using *l*-menthone for forming layers that exhibit desired dielectric properties. The disclosure in Adams is strictly related to combining optically active, non-mesomorphic material with optically negative compositions to achieve desired negative imaging characteristics that are specific to the invention in Adams, and have nothing to do with dielectric pastes for a multi-layered ceramic component.

There is no suggestion or motivation to combine Drozdyk and Adams, and even if there was, there is no suggestion or motivation to modify Drozdyk to use *l*-menthone as a solvent based on the teachings in Adams

Drozdyk is directed to low-firing capacitors dielectrics. Adams, in contrast, is directed to a method of controlling monochromatic collimated light by controlling the light reflection band of a liquid crystal. As discussed above, Adams is particularly concerned with generating and manipulating negatives of an image using a film or layer of an optically negative liquid crystalline material. One of ordinary skill in the art would therefore have no apparent reason to combine Drozdyk and Adams.

Even if a person of ordinary skill in the art was exposed to Drozdyk and Adams in combination, there is no suggestion or motivation to modify Drozdyk to replace its solvents with *l*-menthone. "Ascertaining the differences between the prior art and the claims at issue requires interpreting the claim language, and considering both the invention and the prior art references as a whole." MPEP § 2141.02 (emphasis added). "In determining the differences between the prior art and the claims, the question under 35 U.S.C. § 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." MPEP § 2141.02.I.

In the present instance, the fact that the term *l*-menthone appears in the text of the Adams patent does not provide any motivation to modify Drozdyk to provide it with this solvent. Applicants are the first to recognize the significant improvement in preventing wrinkles and defects of a spacer made from a dielectric paste according to claim 1 and preventing dissolution of a ceramic green sheet binder by a solvent contained in a dielectric paste having the combination of features recited in claim 1.

As discussed in detail above, Adams merely mentions *l*-menthone as one of numerous choices for an optically active, non-mesomorphic material to be combined with an optically negative composition, for negative imaging applications. Adams provides no suggestion, or even a hint, with respect to use of *l*-menthone in a dielectric application. Drozdyk, in contrast, is related to low-firing capacitors dielectrics. Drozdyk, Abstract.

Therefore, without the benefit of Applicants' disclosure, one of ordinary skill in the art would have no apparent reason or be motivated to include *l*-menthone as a solvent in Drozdyk. *See KSR Int'l Co. v. Teleflex Inc., et al.*, 127 S.Ct. 1727, 1740-1741 (2007) (Often, it will be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the market place; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue) (emphasis added).

Donohue fails to teach, suggest, or motivate the weight average molecular weight range for ethyl-cellulose recited in claim 1

The Examiner further states that Donohue teaches "using various polymeric materials, including ethyl cellulose, having molecular weight of 50,000-100,000 (Col. 6, lines 10-45)." Office Action, p. 3. Applicants believe that this is an improper interpretation of the actual teachings from Donohue. Donohue discusses binders in two paragraphs in column 6. First, Donohue states "A wide variety of polymeric materials can be used as the binder for green tape such as ..." Donohue, column 6, lines 11-12. Donohue follows this statement by reciting upward of 25 different examples without any emphasis on any of them, one of which is ethyl

cellulose given as one of multiple examples of cellulosic polymers. Donohue, column 6, lines 13-14.

Next, Donohue follows by a separate paragraph, stating:

A preferred class of polymeric binders for making green tapes for the composition of the invention are those disclosed by Usala in U.S. Pat. No. 4,613,648. These polymeric binders are a mixture of compatible multipolymers of 0-100% wt. C<sub>1-8</sub> alkyl methacrylate, 100-0% wt. C<sub>1-8</sub> alkyl acrylate, and 0-5% wt. ethylenically unsaturated carboxylic acid or amine, the multipolymer being further characterized as having a number average molecular weight (M<sub>n</sub>) of 50,000 to 100,000, a weight average molecular weight (M<sub>w</sub>) of 150,000 to 350,000, the ratio of M<sub>w</sub> to M<sub>n</sub> being no greater than 5.5, the total amount of unsaturated carboxylic acid or amine in the multipolymer mixture is 0.2-2.0% wt., and the glass transition temperature of the polymer and plasticizer therein, if any, is -30° to +45 ° C. Donohue, column 6, lines 29-43 (emphasis added).

Accordingly, the molecular weight recitations in column 6 of Donohue do not modify the “wide variety of polymeric materials” examples given in the paragraph preceding the above-quoted paragraph. Rather, after having recited that a wide variety of polymeric materials can be used, Donohue states that it is preferable to use a class of polymeric binders that are a mixture of compatible multipolymers, C<sub>1-8</sub> alkyl methacrylate, C<sub>1-8</sub> alkyl acrylate, and ethylenically unsaturated carboxylic acid or amine. With respect to the components of this mixture, Donohue adds that the multipolymer has a number average molecular weight of 50,000 to 100,000, and a weight average molecular weight of 150,000 to 350,000. Donohue further adds ratios for these weights and other parameters for the mixture. Donohue, column 6, lines 39-43. Therefore, Donohue does not teach or suggest a dielectric paste having ethyl cellulose having an apparent weight average molecular weight of 110,000 to 190,000 as a binder.

There is no motivation to modify the binder in Drozdyk with the weight average molecular weight recited in Donohue for a multipolymer in a specific mixture that does not include ethyl cellulose

The range recited from Donohue by the Examiner is for a number average molecular weight. However, the range recited in claim 1 is for a weight average molecular weight. The weight average molecular weight range in Donohue for the above-described

multipolymer is 150,000 to 350,000. As demonstrated above, this range is not for ethyl cellulose. Therefore, there is no suggestion or motivation to apply this range for ethyl cellulose in Drozdyk.

Even if this range was somehow considered to have any relevance to the present case, which it does not, it is largely outside the recited range in claim 1. As discussed in detail in Applicants' Amendment dated April 21, 2009 ("April Amendment"), Comparative and Working Examples provided in the present application as filed, demonstrate the criticality of the range recited in claim 1. *See* April Amendment, pp. 7-8.

The Comparative and Working Examples demonstrate the criticality of an apparent weight average molecular weight for ethyl cellulose with a lower limit of 110,000 and upper limit of 190,000, for establishing continuity of a spacer layer and preventing cracks and wrinkles. As the Comparative Examples summarized in the April Amendment demonstrate, molecular weight average values outside the claimed range resulted in cracks, wrinkles, and discontinuity of the spacer layer. Donohue's molecular weight range is for a multipolymer (not stated to be cellulosic) within a specific mixture, and not a range that is recognized by Donohue to be for ethyl cellulose or to have any advantages for a dielectric paste as claimed. Therefore, this is not a case where the prior art teaches a relevant range for achieving a particular result, and the claimed range cannot be said to be achievable by routine experimentation or an optimization of a known range to optimize the same particular result.

Accordingly, one of skill in the art would not be motivated to pick one of over 25 examples of polymeric materials recited in Donohue as a binder, and then choose the weight average molecular weight of 150,000 to 350,000 recited in Donohue for a multipolymer in a specific mixture discussed separately from the examples of polymeric materials that included ethyl cellulose, and further modify this range to 110,000-190,000 and apply it to ethyl cellulose.

Accordingly, claim 1, and dependent claim 2, which is dependent from claim 1, are allowable.

Independent Claim 3

Claim 3 is directed to a method for fabricating a multi-layered unit for a multi-layered ceramic electronic component, and recites:

a step of printing a dielectric paste including ethyl cellulose having an apparent weight average molecular weight of 110,000 to 190,000 as a binder and at least one kind of solvent selected from the group consisting of isobornyl acetate,  $\alpha$ -terpinyl acetate, I-dihydrocarvyl acetate, I-menthyl acetate, I-menthone, I-perillyl acetate and I-carvyl acetate on a ceramic green sheet containing a butyral system resin as a binder in a predetermined pattern, thereby forming a spacer layer...

The cited references, taken alone or in combination, fail to teach, suggest, or motivate printing a dielectric paste on a ceramic green sheet, the dielectric paste including ethyl cellulose having an apparent weight average molecular weight of 110,000 to 190,000 as a binder and at least one kind of solvent selected from the group consisting of isobornyl acetate,  $\alpha$ -terpinyl acetate, I-dihydrocarvyl acetate, I-menthyl acetate, I-menthone, I-perillyl acetate and I-carvyl acetate.

As demonstrated above, Adams provides no teaching or suggestion with respect to the use of *l*-menthone having any advantages in a dielectric paste. Adams merely mentions *l*-menthone as one of numerous choices for an optically active, non-mesomorphic material to be combined with an optically negative composition, for negative imaging applications. Drozdyk, in contrast, is related to low-firing capacitors dielectrics. Drozdyk, Abstract. Therefore, without the benefit of Applicants' disclosure, one of ordinary skill in the art would not be motivated to include *l*-menthone as a solvent in Drozdyk based on the teachings of Adams, which is in a completely different technical field than that of Drozdyk or that of the present invention.

As further demonstrated above, Donohue does not address any molecular weight with respect to ethyl cellulose. Donohue recites ethyl cellulose as one of over 25 examples of polymeric materials that can be used as a binder, and recites a weight average molecular weight of 150,000 to 350,000 for a multipolymer in a specific mixture discussed separately from the examples of polymeric materials. Even if Donohue had recited the foregoing weight with respect to ethyl cellulose, this disclosure would not render the recited range in claim 3 obvious because as demonstrated above, and discussed in detail in the April Amendment, the recited range in claim 3 is critical to the advantages obtained by Applicants. Therefore, the claimed

range is not an optimized range for optimizing a recognized result. Donohue simply does not recognize any significance of the recited range for ethyl cellulose.

Claim 3 is further amended to recites, “the degree of polymerization of the butyral system resin is equal to or larger than 1000, the degree of butyralization of the butyral system resin being equal to or larger than 64 mol % and equal to or smaller than 78 mol %.” These features were previously in claims 5 and 6. The Examiner rejects claims 5 and 6 as being obvious in view of the Machine Translation of Japanese Publication No. 09-124771, to Kobayashi. The Examiner states that Kobayashi teaches a degree of polymerization of 1,500-2,000 and a degree of butyralization of at least 65 mol%, and that the resin is used for electronic components such as semiconductors and circuit boards. However, as discussed in more detail below, Kobayashi does not broadly state that the butyral resin with the foregoing properties is simply used for electronic components; rather Kobayashi recites specific advantages that have nothing to do with those obtained by the Applicants of the present invention.

The rate of polymerization and degree of butyralization values recited in amended claim 3 are recited as a binder of a ceramic green sheet on which a dielectric paste with the recited composition is printed to form a spacer layer. Applicants are the first to recognize the combination of these features as significantly preventing or eliminating the binder contained in the ceramic green sheet from dissolving by the solvent contained in the dielectric paste. In contrast, Kobayashi merely discloses an anisotropic conductive film used for connection between an LCD, a flexible circuit board, a TAB film, and micro-joining of a semiconductor IC and IC loading circuit board. Kobayashi, ¶ [0001]. Even in this context, Kobayashi attributes the advantages of its invention to using a polyvinyl butyral resin and three other specific components “as essential constituents.” Kobayashi, Abstract.

Accordingly, a person of ordinary skill in the art of multi-layered ceramic electronic components dealing with improving a dielectric spacing layer printed on a ceramic green sheet, would have no reason to consult Kobayashi or its teachings related to how its polyvinyl butyral resin is constituted for a completely different application.

Accordingly, claim 3, and dependent claim 4, which is dependent from claim 3, are also allowable.

Applicants respectfully submit that all of the claims remaining in the application are now allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,

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